

# BONY THORAX

## **PATHOLOGY**

### **1.) Aspiration/Foreign Body**

- Inspiration of a foreign material into the airway

### **2.) Atelectasis**

- A collapse of all or part of the lung

### **3.) Bronchiectasis**

- Chronic dilatation of the bronchi & bronchioles

### **4.) Bronchitis**

- Inflammation of the bronchi

### **5.) Chronic Obstructive Pulmonary Disease**

- Chronic condition of persistent obstruction of bronchial airflow

### **6.) Cystic Fibrosis**

- Widespread dysfunction of the exocrine glands
- Abnormal secretion of sweat & saliva & accumulation of thick mucus in the lungs

### **7.) Emphysema**

- Enlargement of alveolar wall caused by alveolar wall destruction & loss of elasticity

### **8.) Epiglottitis**

- Inflammation of the epiglottis

### **9.) Histoplasmosis**

- Infection caused by the yeastlike organism *Histoplasma capsulatum*

### **10.) Sarcoidosis**

- Condition of unknown origin often associated with pulmonary fibrosis

### **11.) Tuberculosis**

- Chronic infection of the lungs due to the *tubercle bacillus*

### **12.) Hyaline Membrane Disease/Respiratory Distress Syndrome**

- Underaeration of the lungs due to a lack of surfactant

### **13.) Metastases**

- Transfer of a cancerous lesion from one area to another

### **14.) Pleural Effusion/Hydrothorax**

- Collection of fluid in the pleural cavity

### **15.) Pneumoconiosis**

- Lung diseases resulting from inhalation of industrial substances

#### **Anthracosis**

- Coal miner's lung or black lung
- Inflammation caused by inhalation of coal dust (anthracite)

#### **Asbestosis**

- Inflammation caused by inhalation of asbestos

#### **Silicosis**

- Inflammation caused by inhalation of silicon dioxide

### **16.) Pneumonia**

- Acute infection in the lung parenchyma

#### **Aspiration**

- Pneumonia caused by inhalation of foreign particles

#### **Interstitial/Viral/Pneumonitis**

- Pneumonia caused by a virus & involving alveolar walls & interstitial structures

#### **Lobar/Bacterial**

- Pneumonia involving the alveoli of an entire lobe without involving the bronchi

#### **Lobular/Bronchopneumonia**

- Pneumonia involving the bronchi and scattered throughout the lung

### **17.) Pneumothorax**

- Accumulation of air in the pleural cavity resulting in collapse of the lung

### **18.) Pulmonary Edema**

- Replacement of air with fluid in the lung interstitium & alveoli

# BONY THORAX

## A.) TRACHEA

### AP PROJECTION

**PP:** Supine/upright; neck slightly extended; MSP  $\perp$  to IR; exposure during slow inspiration

**RP:** Manubrium

**CR:**  $\perp$

**SS:** Air-filled trachea

### LATERAL PROJECTION

**PP:** Seated/upright; hands clasped behind the body; shoulder rotated posteriorly (prevents superimposition of arms & superior mediastinum); neck extended slightly; exposure during slow inspiration

**RP:** Midway b/n jugular notch & midcoronal plane (for trachea); 4-5 in. lower (for superior mediastinum)

**CR:**  $\perp$

**SS:** Air-filled trachea & superior mediastinum

**ER:** described by Eiselbeg & Sgalitzer

- Used to demonstrate retrosternal extensions of the thyroid gland
- Thymic enlargement in infants (recumbent position)
- Opacified larynx & upper esophagus
- Outline of trachea & bronchi

For foreign body localization

## B.) CHEST

### PA PROJECTION

**PP:** Upright/seated-upright (always); chin extended upward; dorsal aspect of hands against the hips (rotates scapulae laterally; depress shoulder; pull breast upward & laterally (female); exposure after second full inspiration (general) or end of full inspiration & expiration (for presence of pneumothorax & foreign body)

**RP:** T7

**CR:**  $\perp$

**SS:** Entire lung field

- Sharp outline of heart
- Sharp outline of diaphragm (expiration)
- Ten posterior ribs above diaphragm

### Upright Position Rationale:

- Diaphragm at its lowest position
- Air-fluid levels are seen
- Avoid engorgement of the pulmonary vessels

### AP PROJECTION

**PP:** Supine/upright; back against IR; place hands on hips; elbow flexed; hand pronated

**RP:** 3 in. inferior to jugular notch

**CR:**  $\perp$

**SS:** Somewhat similar to PA but magnified

- Magnified heart & great vessels
- Lung fields appear shorter
- Clavicle projected higher
- Ribs assume horizontal position

### Resnick Recommendation:

- CR 30° caudad to midsternal region
- **Rationale:** to free basal portions of the lung fields from superimposition by anterior diaphragmatic, abdominal & cardiac structures

## LINDBLOM METHOD

### AP AXIAL PROJECTION

**PP:** Upright; step 1 foot in front; lean backward in extreme lordosis; elbow flexed; pronate hands beside the hips; shoulder against IR;

**RP:** Midsternum

**CR:**  $\perp$  or 15-20° cephalad (no leaning backward)

**SS:** Lung apices inferior to shadow of clavicles

- Demonstrate interlobar effusions

**ER:** Used in preference to PA axial projection in hypersthenic patient & whose clavicles occupy a high position

# BONY THORAX

## PA AXIAL PROJECTION

**PP:** Upright; chin rested against the IR; elbow flexed; pronate hands on hips; depress shoulder & rotated forward; exposure at end of full inspiration

**RP:** T3

**CR:** 10-15° cephalad

**SS:** Lung apices superior to shadow of clavicles

## LATERAL PROJECTION

**PP:** Upright/seated-upright; left side against the IR (for heart & left lung) or right side against the IR (for right lung); MSP // to IR; MCP ⊥ to IR; arms extended directly upward; elbow flexed; forearm resting on elbows

**RP:** T7

**CR:** ⊥

**SS:**

- Heart, aorta & left-sided pulmonary lesions (left lateral)
- Right-sided pulmonary lesions (right lateral)

**ER:**

- Employed to demonstrate the interlobar fissures
- To differentiate the lobes
- To localize pulmonary lesions

## PA OBLIQUE PROJECTION

**PP:** Upright/seated-upright; LAO/RAO (affected side up); body rotated 45° toward unaffected side; 55-60° (for cardiac series; )10-20° (for study of pulmonary diseases); shoulder of unaffected side against IR

**RP:** T7

**CR:** ⊥

**SS:**

- **LAO:**
  - Maximum area of right lung
  - Trachea & carina
  - Entire right branch of bronchial tree
  - Heart, descending aorta & aortic arch
  - Esophagus (if barium filled)

- **RAO:**

- Maximum area of left lung
  - Trachea
  - Entire left branch of bronchial tree
  - Best image of left atrium, anterior portion of apex of left ventricle & right retrocardiac space
  - Esophagus (if barium filled)
- Medial part of right middle lobe & lingula of the left upper lobe free from hilum (CR 10-20°)

## AP OBLIQUE PROJECTION

**PP:** Upright/supine; LPO/RPO (affected side down); body rotated 45° toward affected side; shoulder of affected side against IR

**RP:** 3 in. inferior to jugular notch

**CR:** ⊥

**SS:**

- **LPO:** maximum area of left lung; similar to RAO
- **RPO:** maximum area of right lung; similar to LAO

**ER:**

- Used when patient is too ill to be turned in prone position
- Supplementary position in investigation of specific lesions
- Used with recumbent patient in contrast studies of the heart & great vessels

## AP/PA PROJECTION

### R or L Lateral Decubitus

**PP:** Lateral decubitus; patient lie on affected side (for pleural effusion) or unaffected side (pneumothorax); body elevated 2-3 in.; arms well above the head; remain in position for 5 minutes before exposure

**RP:** 3 in. inferior to jugular notch (AP) or T7 (PA)

**CR:** Horizontal

# BONY THORAX

## ER:

- Used to demonstrate the change in fluid position (pleural effusion)
- Reveals any previously obscured pulmonary areas
- Demonstrate the presence of any free air (pneumothorax)

## Ekimsky Recommendation:

- Patient leaning laterally 45°
- **Rationale:** for demonstration of small pleural effusions

## LATERAL PROJECTION

### R or L Position

#### Ventral/Dorsal decubitus Position

**PP:** Supine/prone; thorax elevated 2-3 in.; remain in position 5 minutes before the exposure; extend arms well above the head; affected side against the IR

**RP:** 3 in. inferior to jugular notch (ventral decubitus) or T7 (dorsal decubitus)

**CR:** Horizontal

## ER:

- Used to demonstrate the change in fluid position
- Reveals pulmonary areas that obscured by fluid in standard projection

## C.) STERNUM

### PA OBLIQUE PROJECTION

**PP:** Prone or upright (trauma patient); RAO; body rotated 15-20° (prevents superimposition of sternum & vertebrae); long exposure time: slow, shallow breaths during exposure; short exposure time: suspend breathing at the end of expiration

**RP:** T7 of elevated side of posterior thorax & 1 in. lateral to MSP

**CR:** ⊥

**SS:** Best projection to demonstrate sternum

- Sternum free of superimposition from vertebral column

- Sternum projected over the heart

## AP Oblique Projection:

- LPO position
- For trauma patients in supine position

## MOORE METHOD

### PA OBLIQUE PROJECTION

**PP:** Modified prone position; tube positioned over the patient's right side; patient stand at the side of table; bend at the waist; arms above shoulders; palms down on table

**RP:** level of T7 & 2 in. to the right of spine

**CR:** 25° toward MSP; large patient (less angulation); small patient (more angulation)

**SS:** Sternum free of superimposition from vertebral column

**ER:** Perform on an ambulatory patient who is having acute pain to provide comfort & to produce high-quality sternum image

- Sternum projected over the heart

## LATERAL PROJECTION

### R or L Position

**PP:** Lateral recumbent/upright or dorsal decubitus (for patient with severe injury); patient in true lateral position; broad surface of sternum ⊥ to IR; suspended deep inspiration

**RP:** Lateral border of midsternum

**CR:** ⊥

**SS:** Best demonstrate the entire length of sternum & its surrounding tissue

## D.) STERNOCLAVICULAR JOINTS

### PA PROJECTION

**PP:** Prone or upright (trauma patient); arms along the sides; palms facing upward; head turned facing the affected side for unilateral examination (rotates the spine slightly away from side of interest); head rested on chin for bilateral examination

**RP:** T3

**CR:** ⊥

# BONY THORAX

**SS:** Sternoclavicular joints

## KURZBAUER METHOD LATERAL PROJECTION

**PP:** Lateral recumbent; affected side against IR; hips & knee flexed; arm of affected grasp the end of table (for support); arm of unaffected side grasp the dorsal surface of hip (depressed shoulder); anterior surface of manubrium  $\perp$  to IR

**RP:** Lowermost sternoclavicular articulation

**CR:** 15° caudad

**SS:** Unobstructed sternoclavicular joint

## PA OBLIQUE PROJECTION Body Rotation Method

**PP:** Prone or seated-upright (trauma patient); RAO/LAO; body rotated 10-15° toward affected side (projects vertebrae well behind the SC joint)

**RP:** Level of T2-T3 (3 in. distal to vertebral prominens) & 1-2 in. lateral from MSP

**CR:**  $\perp$

- **Entrance:** right side (left SC joint); left side (right SC joint)

**SS:** Sternoclavicular joints

## PA OBLIQUE PROJECTION Central Ray Angulation Method

**PP:** Prone or seated-upright (trauma patient); chin rested on table or rotated toward the side of interest

**RP:** Level of T2-T3 (3 in. distal to vertebral prominens) & 1-2 in. lateral from MSP

**CR:** 15° toward MSP

- **Entrance:** right side (left SC joint); left side (right SC joint)

**SS:** Sternoclavicular joints

## D.) RIBS

### PA PROJECTION

**PP:** Upright/prone; hands rested against hips; palms turned outward; chin rested on chin; suspend at full inspiration (depresses diaphragm)

**RP:** T7

**CR:**  $\perp$  or 10-15° caudad (to demonstrate 7th-9<sup>th</sup> ribs)

**SS:** Anterior ribs (1<sup>st</sup>-9<sup>th</sup>) above the diaphragm

### AP PROJECTION

**PP:**

- **Upright:** to image ribs above diaphragm; IR top board 1.5 in. above shoulder; shoulder rotated forward; suspend at full inspiration (to depress diaphragm)
- **Supine:** to image ribs below diaphragm; shoulder in the same transverse plane; suspend at full expiration (to elevate diaphragm)

**RP:** T7 (upper ribs) or T10 (lower ribs)

**CR:**  $\perp$

**SS:** Posterior ribs above the diaphragm (1<sup>st</sup>-10<sup>th</sup>) & below the diaphragm (8<sup>th</sup>-12<sup>th</sup>)

### AP OBLIQUE PROJECTION

**PP:** RPO/LPO; body rotated 45° (affected side down); arm of affected side abducted; opposite hand on hip

- **Upright:** to image ribs above diaphragm; hand rested on head; suspend at full inspiration (to depress diaphragm)
- **Supine:** to image ribs below diaphragm; hip elevated; suspend at full expiration (to elevate diaphragm)

**RP:** T7 (upper ribs) or T10 (lower ribs)

**CR:**  $\perp$

**SS:** Axillary ribs closest from IR

### PA OBLIQUE PROJECTION

**PP:** RAO/LAO; body rotated 45° (affected side up)

- **Upright:** to image ribs above diaphragm; forearm of affected side rested on grid device; suspend at full inspiration (to depress diaphragm)

## BONY THORAX

- **Supine:** to image ribs below diaphragm; patient rested on forearm; knee of elevated side flexed; suspend at full expiration (to elevate diaphragm)

**RP:** T7 (upper ribs) or T10 (lower ribs)

**CR:**  $\perp$

**SS:** Axillary ribs away from IR

### AP AXIAL PROJECTION

**PP:** Supine; head rested directly on table (to avoid accentuating the dorsal kyphosis); arms along sides of the body

**RP:** 2 in. superior to xiphoid process

**CR:** 20° cephalad

- Increase 5-10° angle (patient w/ pronounced dorsal kyphosis)

**SS:** Costal joints

- Costovertebral & costotransverse joints

☺ THE END ☺

*“BOARD EXAM is a matter of PREPARATION. If you FAIL to prepare, you PREPARE to fail”*

*04/09/14*